Service
Guide
Book

McQuay®
Air Conditioning

Table of Contents

Model Name

Product Name Description

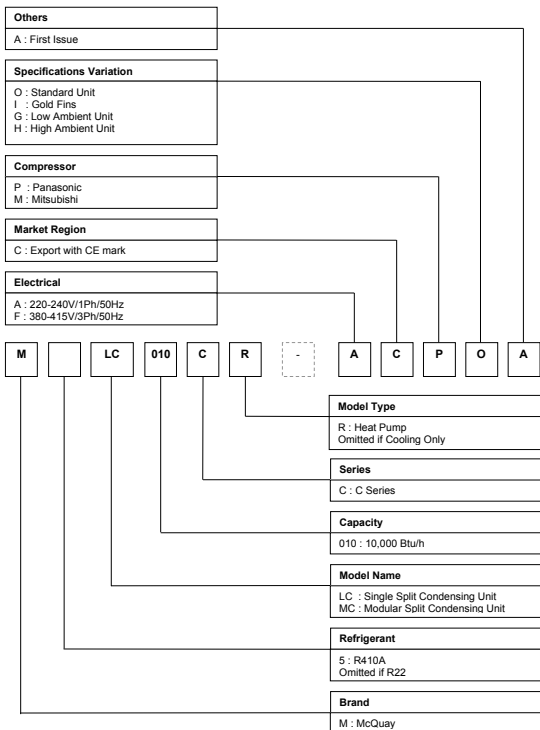| No.	Description	Generic Model Name	McQuay Brand
1	Wall Mounted Fan Coil Unit	WM / 5WM	MWM / M5WM
2	Wall Mounted AC Inverter Fan Coil Unit	WMV	MWMV
3	Wall Mounted DC Inverter Fan Coil Unit	5WMX	M5WMX
4	Ceiling Exposed Fan Coil Unit	CE / 5CE	MCM / M5CM
5	Ceiling Cassette Fan Coil Unit	CK / 5CK	MCK / M5CK
6	Ceiling Concealed Fan Coil Unit	CC / 5CC	MCC / M5CC
7	Ducted Split Blower Unit	SB	MDB
8	Chilled Water Fan Coil Unit	CW	MCW
9	Water Source Heatpump Split Unit	WSS / 5WSS	MWSS / M5WSS
10	Horizontal Water Source Heatpump Unit	WH	MWH
11	Air Cooled Mini Chiller	AC / 4AC / 5AC	MAC / M4MAC / M5MAC
12	Single Split Condensing Unit	SL / 4SL / 5SL	MLC / M4LC / M5LC
13	Single Split AC Inverter Condensing Unit	SLV	MLCV
14	Single Split DC Inverter Condensing Unit	5SLX	M5LCX
15	Modular Split Condensing Unit	MSS / 4MSS	MMC / M4MC
16	Multi Split Series	MSD / 4MSD	MMSD / M4MSD
		MST / 4MST	MMST / M4MST
		MSH	MMSH
17	Multi Split AC Inverter Condensing Unit	MSV	MMSV
18	Multi Split DC Inverter Condensing Unit	5MSX	M5MSX
19	Horizontal Condensing Unit	HDC / 5HDC	MHDC / M5HDC
20	Vertical Condensing Unit	VCU	MVCU
21	Air Cooled Roof Top Packaged Air Conditioner	RT / 4RT	MRT / M4RT
22	Air Cooled Inverter Mini Chiller	5ACV	M5ACV

Nomenclature

Indoor Unit

Others
A : First Issue

Grille Type
A : Grille A

Air Treatment Devices & Control
I : Negative Ion L : Bare Unit

Market Region
C : Export with CE mark

Electrical
A : 220-240V/1Ph/50Hz F : 380-415V/3Ph/50Hz

M		WM	010	G	R	-	A	C	I	A	A

Model Type
R : Heat Pump Omitted if Cooling Only

Series
G : G Series

Capacity
010 : 10,000 Btu/h

Model Name
WM : Wall Mounted CK : Ceiling Cassette

Refrigerant
5 : R410A Omitted if R22

Brand
M : McQuay

Indoor Unit

Product Specifications Variation
AA : Revision

Connection Type
F : Flare
X : Not Applicable

Electrical
A : 220-240V/1Ph/50Hz
F : 380-415V/3Ph/50Hz

M		WM	010	G	W		-	A	X	A	A

Piping
H : 4 Pipes System
Omitted if 2 pipes system

Model Type
R : Heat Pump
W : Chilled Water Fan Coil
Omitted if DX Cooling Only

Series
G : G Series

Capacity
010 : 10,000 Btu/h

Model Name
WM : Wall Mounted
CK : Ceiling Cassette

Refrigerant
5 : R410A
Omitted if R22

Brand
M : McQuay

Indoor Unit

Others
A : First Issue

Specifications Variation
O : Standard Unit
I : Gold Fins
G : Low Ambient Unit
H : High Ambient Unit

Compressor
P : Panasonic
M : Mitsubishi

Market Region
C : Export with CE mark

Electrical
A : 220-240V/1Ph/50Hz
F : 380-415V/3Ph/50Hz

M		LC	010	C	R	-	A	C	P	O	A

Model Type
R : Heat Pump
Omitted if Cooling Only

Series
C : C Series

Capacity
010 : 10,000 Btu/h

Model Name
LC : Single Split Condensing Unit
MC : Modular Split Condensing Unit

Refrigerant
5 : R410A
Omitted if R22

Brand
M : McQuay

Conversion Table

Conversion Table

Capacity

Btu/hr	MBH	kCal/Hr	kW
1	0.001	0.252	0.293×10^{-3}
1000	1	252	0.293
3.968	0.004	1	1.162×10^{-3}
3412	3.412	860.04	1

Pressure

PSI	kg/cm^2	W.G.		Pascal (Pa)
		(in.)	(ft.)	
1	0.07	27.7	2.309	0.69×10^4
14.22	1	394.08	32.84	9.81×10^4
3.61×10^{-2}	2.538×10^{-3}	1	0.083	248.84
1.45×10^{-4}	0.1×10^{-4}	0.004	3.349×10^{-4}	1

Flow Rate

L/s	m^3/hr	m^3/s	U.S. GPM	CFM
1	3.6	0.001	15.85	2.119
0.278	1	0.278×10^{-3}	4.403	0.588
1000	3600	1	15850	2119
0.063	0.227	0.063×10^{-3}	1	0.1337
0.472	1.7	0.472×10^{-3}	7.481	1

Temperature

$$°F = (18 \times °C) + 32$$
$$°C = \frac{°F - 32}{1.8}$$

Velocity

fps	m/s	fpm
1	0.305	60
3.281	1	196.9
0.017	0.005	1

Volume

L	m^3	U.S. G.P.M.	ft^3
1	0.001	0.264	0.0353
1000	1	264	35.3
3.785	3.785×10^{-3}	1	0.134
28.315	0.028	7.48	1

Area

in^2	ft^2	m^2	cm^2
1	6.94×10^{-3}	6.452×10^{-4}	6.452
144	1	0.093	929.03
1550.06	10.764	1	1×10^4
0.155	1.076×10^{-3}	1×10^{-4}	1

Product Mainboard vs. Handset Matrix

Type	No.	Main Board (IC) Model	L2.0	L208A	U1SB125	SQ2.0	VA2.0	Handset Standard	Handset Optional
	1	WM - F Series	X					G7	SLM3 + AC5300 / Netware 3
	2	WM - G Series	X					G11	SLM3 + AC5300 / Netware 3
	3	WMS - G Series	X					G11	SLM3 + AC5300 / Netware 3
	4	CK - A/B/C Series		X				G7	SLM3 + AC5300 / Netware 3
	5	CE - D Series		X				G7	SLM3 + AC5300 / Netware 3
	6	CE - E Series		X				G11	SLM3 + AC5300 / Netware 3
	7	CC - C Series		X				SLM3	Netware 3
	8	CC - D Series		X				Netware 3	SLM3
	9	SB - B/C Series							
		SB 75 – 100B/BR		X				SLM3	Netware 3
		SB 125 – 150B/BR			X			SLM3	-
		SB 125CR			X			SLM3	-
DX		SB 150B2/BR2 – 600B4/BR4				X		SQ-LCD	-
	10	SB – D/ER Series							
		SB 75 – 100D/ER		X				SLM3	Netware 3
		SB 125 – 150D/ER			X			SLM3	-
		SB 125D2 – 500D4				X		SQ-LCD	-
		SB 125ER2 – 600ER4				X		SQ-LCD	-
	11	RT Series							
		RT 55 – 120AVAR			X			SLM3	-
		RT 150 – 420AVAR				X		SQ-LCD	
	12	WMX – G Series					X	G11	SLM3 + AC5300
		CKX – A/C Series					X	G7	SLM3 + AC5300
		CEX – E Series					X	G11	SLM3 + AC5300
		CCX – C Series					X	SLM3	Netware 3

Type	No.	Main Board (IC) Model	W2	MCH1	MC1.0	LWS2.0	APM01CB	APM02D	Handset Standard	Handset Optional
CW FCU	13	WM – GW Series	X						G11	SLM3 + AC5300 / Netware 3
	14	CK – AW/AWH/CW Series	X						G7	SLM3 + AC5300 / Netware 3
	15	CE – DW Series	X						G7	SLM3 + AC5300 / Netware 3
	16	CE – EW Series	X						G11	SLM3 + AC5300 / Netware 3
	17	CC – CW Series	X						SLM3	Netware 3
	18	SB – BW Series	X						N/A	-
Mini Chiller	19	AC – C Series								
		AC 20 – 60C/CR		X					C. Panel	-
		AC 80 – 150C/CR			X				C. Panel	-
		5AC 20 – 25C/CR		X					C. Panel	-
		5AC 30 – 55C/CR			X				C. Panel	-
	20	5WMWS – GR				X			G7	SLM3 + AC5300 / Netware 3
	21	5CKWS – AR/CR				X			G7	SLM3 + AC5300 / Netware 3
WSHP	22	5CCWS – CR				X			SLM3	Netware 3
	23	WH 11 – 20B/BR					X		SLM15A	-
		WH 25 – 70B/BR						X	APW04A	-

Controller Development History

Year	Main Board	Handset		Model		Remarks
		Wireless	Wired	Cooling	Heating	
1996	Challenger 2.1 & 2.2	G3	-	WM 10/15D	WM 10/15DR	Copper sensor
1996	Challenger 2.2	G3	-	WM 20/25C	WM 20/25CR	Copper sensor
1996	Challenger 2.2	G3	-	WM 07/10E	-	Copper sensor
1997	Challenger 2.4	G3 & G6	-	WM 10/15D	WM 10/15DR	
1998	Challenger 2.4	G3 & G6	-	WM 20/25C	WM 20/25CR	
1998	Challenger 5	G3 / G6	-	WM 07/10E / WM 10/15F	WM 07/10ER / WM 10/15FR	
1999	Challenger C3A / Challenger C3B / Challenger C3B	G3 & G6	SLM2 (10 core wire)	CE-C/D / CC-B/MSB/HSB	CK-AR / CE-CR/DR / CC-RMSB-R/HSB-R	
2000	Mini Chiller MCH01	-	-	AC (40-125)B	AC (40-125)BR	Cooling & Heatpump
2001	Chilled Water W1V2	G6	Netware 1	WM-F/V / CE-DW / CC-CW / CK-AW / HSB-BW	-	Convertible PCB
2001	Sequential Controller	-	Sequential Controller	SB (150-500)B	SB (150-500)BR	Multiple compressor
	Universal Board					
2001	D1.0	G6	-	WM (10-25)F	WM (10-25)FR	Cooling only
2001	U1.3	G6	-	-	-	Heatpump only
2001	U1.4	G6	SLM3 (4 core wire)	CE-D / CK-A / CC-C	CE-DR / CK-AR / CC-CR	Cooling & Heatpump
2001	D2.0	G6 / G7	-	WM (10-25)F	-	Cooling only
2001	Mini Chiller SZMC01	-	-	AC/4AC (40-58)A, AC/4AC75-125B	AC/4AC (40-58)AR, AC/4AC75-125BR	Cooling & Heatpump
2001	Inverter VA1.9 (Indoor) VB1.0 (Outdoor)	G7 Turbo	-	-	WMV10FR SLV10BR	In set form only
2002	Sequencer Controller D2.0	-	SO-LCD	SB (150-500)D / WM30F	SB (150-500)DR	Multiple compressor / Cooling only
2002	U1.4	G7	SLM3 / Netware 2 (optional)	CK (15/20/25/30)B	WM (10-25)FR, WM30FR / CK (15/20/25/30)BR	Heatpump only / Cooling & heatpump

Year	Main Board	Handset		Model		Remarks
		Wireless	Wired	Cooling	Heating	
2002	Chilled Water W1V3	G6	SLM3 / Netware 2 (optional)	WM-FW / CE-DW / CC-CW / CK-AW / CK-BW		Valveless application only
2002	Multi Split Indoor, MS10.0	G7	-		WMS (10-20)FR	Auto random restart
2003	Mini Chiller MCH03A	-	SC302	AC/4AC(80-150)C	AC/4AC (80-150)CR	Cooling & heatpump
2003	Universal U1SB125	-	SLM3 – single speed	SB (125/150) B1/C1/D1 RT/4RT (60-120)A	SB (125/150) BR1/CR1/DR1 RT/4RT (60-120)AR	Cooling & heatpump
2003	Sequential Controller, SQ	-	SQ-LCD	RT/4RT (150-300)A SB 150d2-600d4 SB 125D2-500D4	RT/4RT (150-300)AR SB 150BR2-600BR4 SB 125DR2-500DR2	Cooling & heatpump
2004	U1.4	G7	-	CK (10-20)C	CK (10-20)CR	Cooling & heatpump
2004	L2.0	G11	-	WM (07-15)G WM (20-25)G	WM (07-15)GR WM (20-25)GR	Cooling & heatpump
2004	MC01	-	Chiller Panel	AC (80-150)C	AC (80-150)CR	Cooling & heatpump
2004	MCH01	-	Chiller Panel	AC (20-60)C	AC (20-60)CR	Cooling & heatpump
2005	L208A	G11	Netware 3	CE (15-28)E CC (75-100)D	CE (15-28)ER CC (75-100)ER	Cooling & heatpump
2005	U1.4 Universal U1SB125 Sequential Controller, SQ	-	SLM3 SLM3 – single speed SQ-LCD		SB (75-100)ER SB (125-150)ER1 SB 125ER2-600ER4	Heatpump only
2005	Inverter VA2.0	G11	Inverter		5WMX (10-25)GR 5SLX (10-25)GR	In set form only
2005	MC01	-	Chiller Panel		5AC (030-055)CR	Heatpump only
2006	L208A	G7 & G11	SLM3 / Netware 3	CE-D / CK-A/B/C / CC-C	CE-DR / CK-AR/BR/CR / CC-CR	Cooling & Heatpump
2006			SLM3	SB (75-100)B/D	SB (75-100)BR/ER	Cooling & Heatpump
2006	Sequential Controller, SQ	-	SQ-LCD	RT (360-420)A	RT (360-420)AR	Cooling & Heatpump
2006	Chilled Water W2	G7 & G11	SML3 / Netware 3	WM-GW / CE-DW / CE-EW / CC-CW / CK-AW/AWH/CW / SB-BW		Cooling & Heatpump

Handset Operating Guide

G6

Outlook
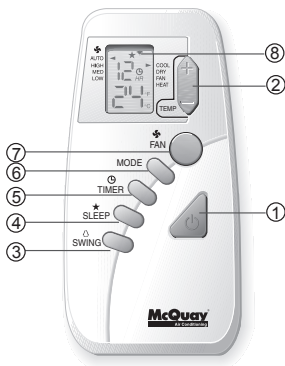
Operation Guide

1. "ON/OFF" Switch
   - Press to start the air conditioner unit.
   - Press again to stop the unit.

2. Temperature Setting
   - Set the desire room temperature.
   - Press button to increase or decrease the set temperature. Setting range are between 16°C TO 30°C setting (60°F to 80°F) (Optional setting from 20°C to 30°C).
     Press ▲ or ▼ button simultaneously will toggle the temperature setting between °C and °F.

3. Automatic Air Swing
   - Press the button to activate the automatic air swing function. The swing angle ranging from horizontal to 25° to bottom.

4. "SLEEP" MODE
   - Press the button to activate sleep mode. This mode can only be activated while in cooling or heating mode operation. If it is activated in "COOL" mode, the set temperature will be increase 0.5°C after 30 minutes, 1°C after 1 hour and 2°C after 2 hours. Whereas in "HEAT" mode, the set temperature will decrease by 1°C after 30mins, 2°C after 1 hour and 3°C after 2 hours.
   - This function is available under COOL, HEAT & AUTO mode.

5. Timer Setting
   - Press set button to activate the timer setting (from 1 hour to 15 hour) of the air conditioning unit. It will be in "On" or "Off" condition after the set time depending to the current condition (either from "On" to Off" or vise versa)
   - To cancel the timer setting, press the button continuously until the timer display goes off.

6. Operation Modes
   - Press the "mode" button for select the type of operating mode.
   - Cooling only unit:
         Cool → Dry → Fan.
   - Heatpump unit:
         Auto → Cool → Dry → Fan → Heat

7. Fan Speed and Ventilation Mode Selection
   Press the button until the desired fan speed is achieved.

8. Signal Transmission Indication
   Blink to confirm the last setting has been send to the unit.

G7

Outlook
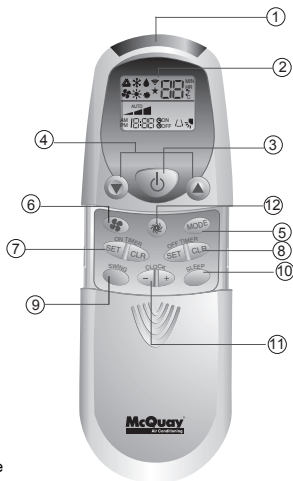
Operation Guide

1. Transmission Source
   - The source where the signal will be transmitted.

2. Signal Transmission Indication
   - Blink to confirm the last setting has been send to the unit.

3. On/Off Button
   - Press once to start the air conditioner.
   - Press again to stop the unit.

4. Temperature Setting
   - To set the desired room temperature, press the button to increase or decrease the set temperature.
   - The temperature setting range is from 16°C to 30°C (Optional setting 18°C to 30°C).
   - Press both buttons simultaneously to toggle the temperature setting between °C and °F.

5. Operation Mode
   - Press the MODE button to select the type of operating mode.
   - For cooling only unit, the available modes are : COOL, DRY & FAN.
   - For heat pump unit, the available modes are : AUTO, COOL, DRY, FAN & HEAT.

6. Fan Speed Selection
   - Press the button until the desired fan speed is achieved.

7. On Timer Setting
   - Press the SET button will activate the on timer function.
   - Set the desired on time by pressing the SET button continuously. If the timer is set to 7.30am, the air conditioner will turn on at 7.30 sharp.
   - Press the CLR button to cancel the on timer setting.

8. Off Timer Setting
   - Press the SET button will activate the off timer function.
   - Set the desired off time by pressing the SET button continuously.
   - Press the CLR button to cancel the off timer setting.

9. Automatic Air Swing (Optional)
   - Press the SWING button to activate the automatic air swing function.
   - To distribute the air to a specific direction, press the SWING button and wait until the louver move to the desired direction and press the button once again.

10. Sleep Mode Setting
   - Press the button to activate sleep mode. This function is available under COOL, HEAT & AUTO mode.
   - When it is activated in COOL mode, the set temperature will be increased 0.5°C after 30mins, 1°C after 1 hour and 2°C after 2 hours.
   - When it is activated in HEAT mode, the set temperature will be decreased 1°C after 30mins, 2°C after 1 hour and 3°C after 2 hours.

11. Clock Time Setting
   - Press button + or - to increase or decrease the clock time.

12. Turbo Function (Optional – Only Applicable To Inverter Unit)
   - Press button for fast cooling or heating operation.
   - The temperature will be increased internally if it is in the HEAT mode, decreased if in COOL or DRY mode. Fan speed will be increased if it is not at maximum speed.
   - The temperature & fan speed will resume if user setting if the button is pressed again or after 20mins.
   - Available under HEAT, COOL & DRY modes only.

G11

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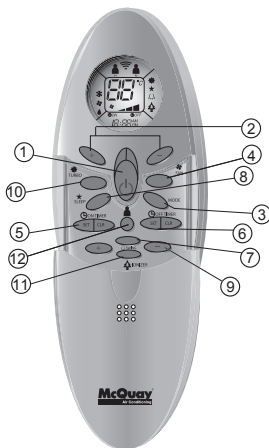
Operation Guide

1. "ON/OFF" ⏻ Button
   - Press once to start the air conditioner unit.
   - Press again to stop the unit.

2. Temperature Setting
   - To set the desired room temperature, press the ▲ button to increase or ▼ button to decrease the set temperature.
   - The temperature setting range is from 16°C to 30°C.
   - Press both buttons simultaneously to toggle ▲ and ▼ from °C to °F setting.

3. Operation Mode
   - Press the MODE button to select the type of operating mode.
   - For cooling only unit, the available modes are: COOL (❄), DRY (♦) and FAN (✚).
   - For heat pump unit, the available modes are: AUTO, COOL (❄), DRY (♦), FAN (✚) and HEAT (✳).

4. Fan speed selection
- Press the ✣ button continuously will toggle the fan speed in the following order: Low (◢) ——: Med (◢◣) ——: High (◢◣◼) ——: Auto
- Stop pressing when the desired fan speed appears on the display screen.

5. ON Timer Setting
- Press the SET button will activate the on timer function.
- Set the desired on time by pressing the SET button continuously. If the timer is set to 7.30am, the air conditioner will turn on at 7.30am sharp.
- Press the CLR button to cancel the on timer setting.

6. OFF Timer Setting
- Press the SET button will activate the off timer function.
- Set the desired off time by pressing the SET button continuously.
- Press the CLR button to cancel the off timer setting.

7. Automatic Air Swing
- Press the SWING (△) button to activate the automatic air swing function.
- To distribute the air to a specific direction, press the SWING button and wait until the louver move to the desired direction and press the button once again.

8. Sleep Mode Setting
- Press the **SLEEP** button will activate the sleep mode function. This function is available under COOL, HEAT and AUTO mode.
- When the unit is operating under cooling mode, the set temperature is increased by 0.5°C after 30 minutes, 1°C after an hour, and 2°C after 2 hours.
- When the unit is operating under heating mode, the set temperature is decreased by 1°C after 30 minutes, 2°C after an hour and 3°C after 2 hours.

9. Clock Time Setting
- Press + button to increase the clock time.
- Press – button to decrease the clock time.

10. Turbo Mode
- Press the TURBO (🍥) button to achieve the required set temperature in a short time.

11. Ionizer
- Press the ♣ button to activate the negative Ion function, which will refresh the indoor air effectively.

12. Personalize Setting
- Press ☺ button and hold for 3s to initiate personalized setting
- Set the individual setting e.g. MODE, SET TEMP or FAN SPEED and leave for 4s to save the setting into the programme.
- 2 groups of settings are allowed to store in the handset. Press once to activate the P1 setting, press again to cycle between P1 and P2.
- Press any key to deactivate the personalize setting.

G17

Outlook
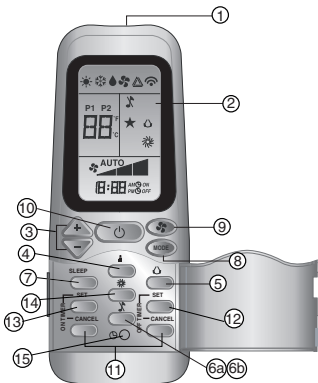
Operation Guide

1. Transmission Source
   - The source where the signal will be transmitted.

2. Signal Transmission Indication
   - Blink to confirm that the last setting has been transmitted to the unit.

3. Temperature Setting
   - To set the desired room temperature, press the ▲ or ▼ button to increase or decrease the set temperature.
   - The temperature setting range is from 16°C to 30°C (optional setting 20°C to 30°C).

4. Personalize Setting
   - Press 👤 and hold for 3s, then 👤 will blink. Press again to cycle between 👤 and 👤.
   - Set the desire setting, then leave the handset for 4s without pressing any key and it will save the setting into the programme.
   - Press 👤 once to activate the P1 setting, press again to cycle between P1 and P2.
   - Press any key to deactivate the personalize setting.

5. Automatic Air Swing (optional)
- Press the SWING ↻ button to activate the automatic air swing function.
- To distribute the air to a specific direction, press the SWING ↻ button and wait until the louver move to the desired direction and press the button once again.

6a. Silent Function
- Press ✗ for quiet operation.
- Fan speed turn to minimum speed.
- Press again to deactivate the function.

6b. Ionizer Function
- Press ♠ button to activate the negative ion function, which will refresh the indoor air effectively.

7. Sleep Mode Setting
- Press the SLEEP button will activate the sleep mode function. This function is available under COOL, HEAT and AUTO mode.
- When the unit is operating under cooling mode, the set temperature is increased by 0.5°C after 30 minutes, 1°C after an hour, and 2°C after 2 hours.
- When the unit is operating under heating mode, the set temperature is decreased by 1°C after 30 minutes, 2°C after an hour, and 3°C after 2 hours.

8. Operating Mode
- Press the MODE button to select the type of operating mode.
- For cooling only unit, the available modes are: COOL (❄), DRY (💧) and FAN (🍃).

9. Fan Speed Selection
- Press the 🍃 button continuously will toggle the fan speed in the following order:

    Low ──────▶ Med ──────▶ High ──────▶ Auto

- Stop pressing when the desired fan speed appears on the display screen.

10. "ON/OFF" Button
- Press one to start the air conditioner unit.
- Press again to stop the unit.

11. Timer Cancel
- Press the TIMER CANCEL button to cancel the on timer setting.

12. OFF Timer Setting
- Press the OFF TIMER button will activate the off timer function.
- Set the desired off time by pressing the OFF TIMER button continuously.

13. ON Timer Setting
- Press the ON TIMER button will activate the on timer function.
- Set the desired on time by pressing the ON TIMER button continuously. If the timer is set to 7.30am, the air conditioner will turn on at 7.30am sharp.

14. Turbo Function
- Press 🌀 for fast cooling.
- Fan speed turn to maximum speed.
- Press again to deactivate the function.

15. Clock Time Setting
- Press 🕐 and hold to set the clock time.

SLM3

Outlook
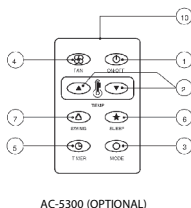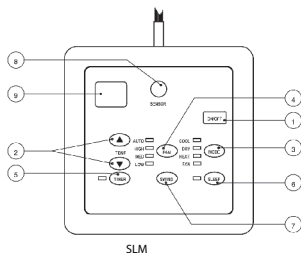
SLM   AC-5300 (OPTIONAL)

Operation Guide

1. "ON/OFF" Switch
   - Press to start the air conditioner unit.
   - Press again to stop the unit.

2. Temperature Setting
   - Set the desired room temperature.
   - Press button to increase or decrease the set temperature. Setting range are between 16°C to 30°C (60°F to 80°F).

3. Operation Modes
   - Press the "mode" button for select the type of operating mode.
     - Cooling Only:
       COOL, DRY, FAN
     - Heat Pump:
       AUTO, COOL, DRY, HEAT, FAN
       (AUTO mode is represented by both COOL and HEAT LED light on)

4. Fan Speed Selection
   - Press the button until the desired fan speed is achieved.

5. Timer
   - Press the set button to select the switch timer of the air conditioner unit (the setting range is between 1 to 10 hours).

6. "SLEEP" Mode
   - Press button to activate the sleep function. This function can only be activated under "cool" or heating mode operation. When it is activated under "cool" mode operation, the set temperature will increase 0.5℃ after 30 minutes, 1℃ after 1 hour and 2℃ after 2 hours. If it is activated under "HEAT" mode operation, the set temperature will be decreased 0.5℃ after 30 minutes, 1℃ after 1 hour and 2℃ after 2 hours.

7. Air Swing
   - Press button to activate the automatic air swing function.

8. Sensor
   - Infra red sensor to receive signals from wireless controller.

9. LED Display
   - To display the set temperature (in ℃) and timer delay setting (in hours).

10. Transmission Source
    - To transmit signals to the air conditioner.

Sequential Controller

Outlook
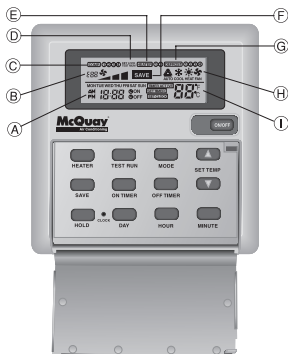
A : Time display
B : Error indication
C : Compressor running display
    (up to 4 compressors)
D : Key lock display
E : Heat display (up to 2 heaters)
F : Energy saving mode display
G : Compressor defrost cycle
    display (up to 4 compressors)
H : Operation mode display
I : Temperature set display

Operating Guide

1. "ON/OFF" Switch
   • Press once to start the air conditioning unit.
   • Press again to stop the unit.
   • The operation lamp next to the key lights up and goes off respectively when the unit is running or not running.
   • Caution : In the case when the ON/OFF key is pressed immediately after the operation is stopped, the unit will not restart until 3 minutes later to protect the compressor.

2. Selecting Operating Mode
   • Press the MODE key to select the type of operating mode. Consecutive press of the key switches the operation over "COOL", "HEAT", "AUTO" and "FAN"

3. SAVE Mode
   • Press the SAVE key to select the energy saving function. This option is only available for "COOL", "HEAT" and "AUTO" modes.

4. Auxiliary Electric Heater
   • If the "HEAT" mode provides insufficient heating to a room even at the highest temperature setting (30°C), press the HEATER key to activate the auxiliary electric heater. For models with two heaters, consecutive press of the key allows the selection of one or both heaters active.

5. Temperature Setting
   • To set the desired room temperature, press ▲ or ▲ to increase or decrease the set temperature in the range of 16°C to 30°C.
   • Press both ▲ and ▲ simultaneously to toggle between °C and °F setting.

6. Time Setting
   Real time clock
   • Press the CLOCK key once to activate set clock mode.
   • Press again to disable set clock mode.
   • Under set clock mode, the time of the present day can be set by pressing the respective MINUTE, HOUR and DAY key.

   7 Days Timer
   • Press the ON TIMER key to activate auto ON timer mode. Under this mode, press the respective MINUTE, HOUR and DAY key to select the time of the week when the air-conditioning unit is to automatically start running. Press ON TIMER key again to save the setting.
   • Press the OFF TIMER key to activate auto OFF timer mode. Under this mode, press the respective MINUTE, HOUR and DAY key to select the time of the week when the air-conditioning unit is to automatically stop running. Press the ON TIMER key again to save the setting.
   • Then to activate the 7 days timer, press and hold the TIMER ACTIVE key until the word "TIMER ACTIVE" appears on the LCD screen. Repeat the same step to disable the 7 days timer.

7. Other Function
   Key Lock
   • Press the MINUTE key 3 times consecutively to activate the key lock. A "KEY LOCK" symbol will appear on the LCD screen. At this point, only the ON/OFF key is valid.
   • To disable the key lock, again press the MINUTE key 3 times consecutively.

   Test Run
   • Press the TEST RUN key 2 times consecutively to test run the unit.

Netware 3
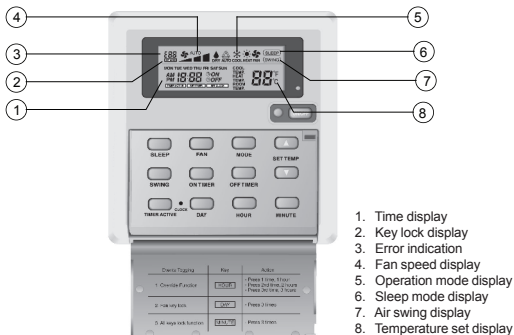
Outlook

1. Time display
2. Key lock display
3. Error indication
4. Fan speed display
5. Operation mode display
6. Sleep mode display
7. Air swing display
8. Temperature set display

Operating Guide

1. "ON/OFF" Switch
   - Press once to start the air conditioning unit.
   - Press again to stop the unit.
   - The operation lamp next to the key lights up and goes off respectively when the unit is running or not running.
   - Caution : In the case when the ON/OFF key is pressed immediately after the operation is stopped, the unit will not restart until 3 minutes later to protect the compressor.

2. Selecting Operating Mode
   - Press the MODE key to select the type of operating mode. Consecutive press of the key switches the operation over "COOL", "HEAT", "AUTO", "DRY" and "FAN"

3. Fan Speed Selection
   - Press the FAN key until the desired fan speed is achieved.

4. Sleep Mode Setting
   • Press the SLEEP key to activate sleep mode. This function is available under COOL, HEAT & AUTO mode.
   • When it is activated in COOL mode, the set temperature will be increased 0.5°C after 30mins, 1°C after 1 hour and 2°C after 2 hours.
   • When it is activated in HEAT mode, the set temperature will be decreased 1°C after 30mins, 2°C after 1 hour and 3°C after 2 hours.

5. Temperature Setting
   • To set the desired room temperature, press ▲ or ▲ to increase or decrease the set temperature in the range of 16°C to 30°C.
   • Press both ▲ and ▲ simultaneously to toggle between °C and °F setting.

6. Air Swing
   • Press the SWING key to activate the automatic air swing function.

7. Time Setting
   Real time clock
   • Press the CLOCK key once to activate set clock mode.
   • Press again to disable set clock mode.
   • Under set clock mode, the time of the present day can be set by pressing the respective MINUTE, HOUR and DAY key.

   7 Days Timer
   • Press the ON TIMER key to activate auto ON timer mode. Under this mode, press the respective MINUTE, HOUR and DAY key to select the time of the week when the air-conditioning unit is to automatically start running. Press ON TIMER key again to save the setting.
   • Press the OFF TIMER key to activate auto OFF timer mode. Under this mode, press the respective MINUTE, HOUR and DAY key to select the time of the week when the air-conditioning unit is to automatically stop running. Press the ON TIMER key again to save the setting.
   • Then to activate the 7 days timer, press and hold the TIMER ACTIVE key until the word "TIMER ACTIVE" appears on the LCD screen. Repeat the same step to disable the 7 days timer.

8. Other Function
   Key Lock
   • Press the MINUTE key 3 times consecutively to activate the key lock. A "KEY LOCK" symbol will appear on the LCD screen. At this point, only the ON/OFF key is valid.
   • To disable the key lock, again press the MINUTE key 3 times consecutively.

Controller Configuration

Auto Random Restart

- Shorted at JH/JP1/J_LST jumper at main board for auto restart (supplied).
- Remove the jumper to have non-auto restart.

D2.0
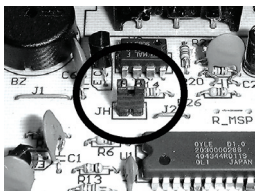
U1.5 / SQ2.0
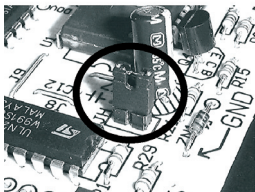
L2.0 / L208A / LW2 / W2
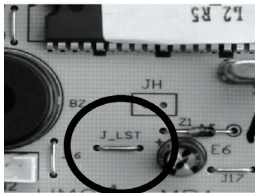
Hot Keep Selection

Three selections available:
   a. Fan stop if indoor coil temperature < 30°C (OFF).
   b. Fan runs at low speed if indoor coil temperature < 30°C and stop if indoor coil temperature < 18°C (ON).
   c. Cycle of low fan running for 30s and fan off for 120s and repeat (INTERVAL).

WM – F/FR (U1.5)
3 selections available at the slide switch on the On/Off Switch Board; Preset at OFF.
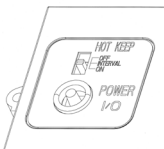
Other models (U1.5)
At CN3 location on the PCB,
   i. Remove the connector to have (b) Fan ON and
   ii. Cut off the <u>big resistor</u> (12kOhm) to have (c) Fan INTERVAL
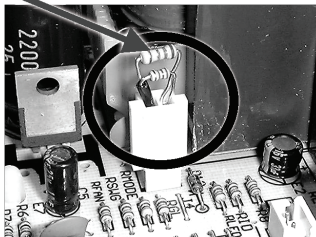
Non-ducted Model – standard setting is (a) Fan OFF
Ducted Model – standard setting is (C) Fan INTERVAL

Auxiliary Heater Conversion

To convert the standard U1.5 heatpump PCB to with auxiliary heater application, the following components need to be added onto the PCB.
1. Heater relay
2. Transistor
3. Diode

RLY 8

Relay 20A / 240V

Diode IN4003

D17

Transistor 2SC945

Q3
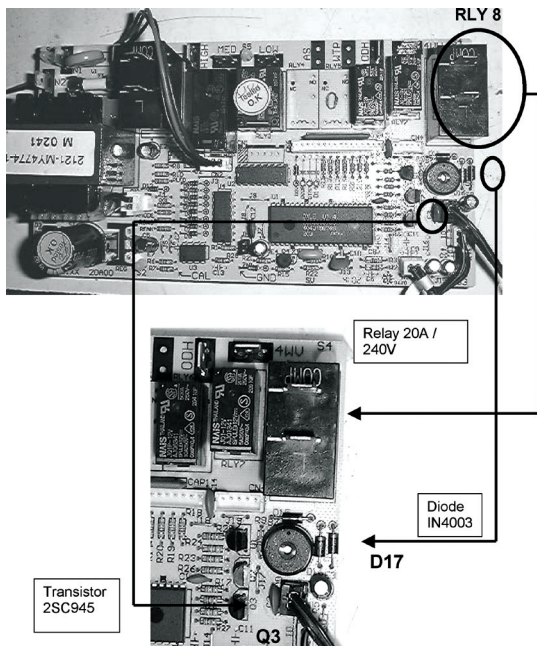
Multi Split Conversion

Cooling Only Model (L2.0 / L208A)
The cooling only model WM-G, CK-A/B/C, CE-E, CC-C which are using L2 control board can be switched to multi split units without any modification needed.

Heatpump Model (L2.0 / L208A)
WM-GR
The Multi Split mode can be selected at the slide switch on the On/Off Switch Board; Preset at OFF.

The outdoor coil sensor has to be removed from the PCB as the reading is taken from the outdoor PCB directly.

CK-AR/BR/CR, CE-ER, CC-CR
The Multi Split mode can be selected by disables the outdoor coil sensor and replace with a dummy resistor 4.7kOhm (provided in the accessory bag).

Sequential Controller

It is allowed to configure the controller to suit individual's need with details below:

Model Selection
1. Number of Compressor
The control can be configured into 4 main type's base on number of compressors by changing "R42" values:

Item	Type	R value
1	Single compressor	3k
2	2 compressors	7.5k
3	3 compressors	22k
4	4 compressors	OPEN

2. Models
For each type, there are 3 models for the control to configure into.

	Dip switch 1	Dip switch 2	Dip switch 5
a. Cooling (SQCn)	Off	Off	Off
b. Heatpump + no heater (SQHn0)	On	Off	Off
c. Heatpump + 1 heater (SQHn1)	Off	On	Off
d. Heatpump + 2 heater (SQHn2)	On	On	Off
e. Auto heatpump + no heater (SQHn0)	On	Off	On
f. Auto heatpump + 1 heater (SQHn1)	Off	On	On
g. Auto heatpump + 2 heater (SQHn2)	On	On	On

n denotes number of compressor(s)
where the postfix number indicates number of compressor(s).

3. Stage Differential Temperature
Differential temperature is the temperature difference between turning on or off 1 compressor to another compressor in thermostat cycle.
The stage differential temperature can be selected from the range shown below:

	Dip switch 3	Dip switch 4
a. Default	Off	Off
b. 0.5°C	On	Off
c. 1.0°C	Off	On
d. 1.5°C	On	On

Note that 1.5°C only valid for 2 and 3 compressors model. For 4 compressors model, maximum allowed is 1.0°C.

The default differential temperature is base on number of compressor model, the setting is as below:

Model	Diff. Temperature
1 compressor	Not. Applicable
2 compressors	0.5°C
3 compressors	1.0°C
4 compressors	1.5°C

4. Hot Keep Option

	Dip switch 6
a. Fan off	Off
b. Fan on	On

5. Operating Modes
The system has 4 operating modes to select with respect to each model selection:

Model	Auto	Cool	Heat	Fan	
SQCn	-	X	-	X	
SQHnh	-	X	X	X	(Dip switch 5 = off)
SQHnh	X	X	X	X	(Dip switch 5 = on)

Where   x denotes modes available
        n = number of compressor(s)
        h = number of heater(s)

6. Last Memory Functions
The power up settings for either with or without the last memory backup is based on the JH1 setting.

	JH1 Setting
a. Last memory backup	JH1 Plugged
b. Without last memory backup	JH1 Removed

7. Sequential Control for Cool Mode

The starting sequence for indoor fan, outdoor fan and compressors is shown as below:
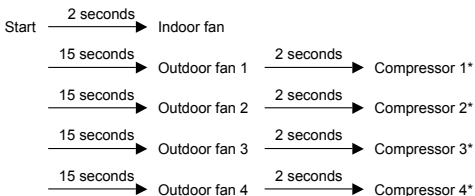
Start ─── 2 seconds ──→ Indoor fan

─── 15 seconds ──→ Outdoor fan 1 ─── 2 seconds ──→ Compressor 1*

─── 15 seconds ──→ Outdoor fan 2 ─── 2 seconds ──→ Compressor 2*

─── 15 seconds ──→ Outdoor fan 3 ─── 2 seconds ──→ Compressor 3*

─── 15 seconds ──→ Outdoor fan 4 ─── 2 seconds ──→ Compressor 4*

*If available and applicable
The compressors will be turned on one by one depending on the on/off conditions shown in the above.

8. Sequential Control for Heat Mode

The starting sequence for indoor fan, outdoor fan and compressors is shown as below:
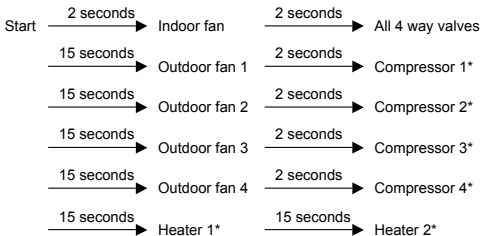
Start ─── 2 seconds ──→ Indoor fan ─── 2 seconds ──→ All 4 way valves

─── 15 seconds ──→ Outdoor fan 1 ─── 2 seconds ──→ Compressor 1*

─── 15 seconds ──→ Outdoor fan 2 ─── 2 seconds ──→ Compressor 2*

─── 15 seconds ──→ Outdoor fan 3 ─── 2 seconds ──→ Compressor 3*

─── 15 seconds ──→ Outdoor fan 4 ─── 2 seconds ──→ Compressor 4*

─── 15 seconds ──→ Heater 1* ─── 15 seconds ──→ Heater 2*

*If available and applicable
The compressors will be turned on one by one depending on the on/off conditions shown in theabove.

9. Conversion from Old Sequential Board to New Sequential Board
(For wiring up to 1000 meters)

9.1 Sequential Main Board SQMB01 (Old Version)

Rework instruction:
SQMB01 (Main Board) from old version to new version
Step 1:Remove Jumper J1 and J2.
Step 2:Add Part: 2051-MAX1483
IC :MAX1483 to U8
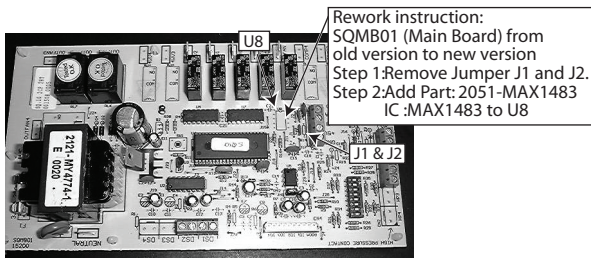
9.2 Sequential Main Board SQMB01 (New Version)

9.3 Sequential Main Board SQMB01 (New Version)

Part: 2051-MAX1483 IC :MAX1483

Jumper J1 and J2 removed
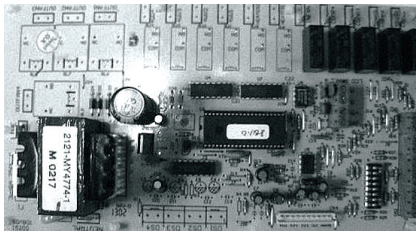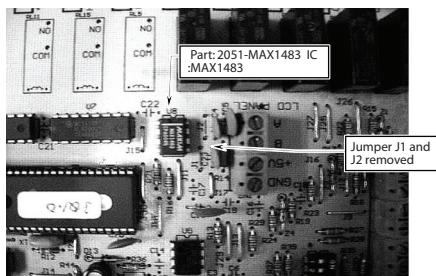
9.4 Sequential LCD Panel SQ-LCD (New Version)

SQLCD (LCD Panel) from old to new
Step 1: Remove Jumper: J1, J2
Step 2: Add Chip Resistor. 1/10W 5% 200K to R8, R9, R10
Step 3: Add Part: 1000000030
        IC: SMD MAX1483CSA to U4
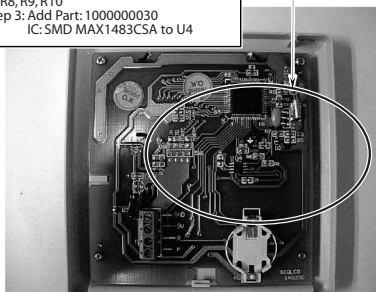
Chilled Water Fan Coil Unit (W1V3)

The standard W1V3 board comes with a VALVE jumper. The system can be configured as the jumper selection listed below:

	VALVE jumper	HEAT jumper
Heatpump Mode & Valve Application	√	√
Heatpump Mode & Valveless Application	X	√
Cooling Mode & Valve Application	√	X
Cooling Mode & Valveless Application	X	X

√ : Jumper Remained   X : Jumper Removed

VALVE & HEAT Jumper Location

Model: WM 05-25FW
  1. VALVE jumper is plugged into JVLV connector on the emergency switchboard.
  2. HEAT jumper is plugged into JMODE connector on the emergency switchboard.

Model: CK 20-50AW, CK 15-25BW, CK 10-20CW, CE 20-50DW and CC 10-60CW
  1. VALVE jumper is plugged into JVLV connector on the main board.
  2. HEAT jumper is plugged into the OD connector on the main board.

VALVE Jumper
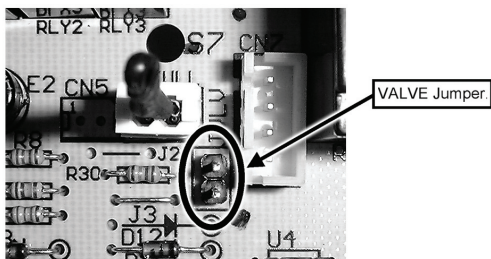
Chilled Water Fan Coil Unit (W2.0)

The system model can be configured via the following jumpers. For each model selected, the permissible operating modes are as follows:

Jumper	Configuration	Model	Operating Modes
M1	2 Pipes without Aux. Heater	1	Heat>Cool>Dry>Fan
M2	2 Pipes with Aux. Heater	2	Heat>Cool>Dry>Fan
M3	4 Pipes + Boiler	3	Heat>Cool>Dry>Auto>Fan
M4	4 Pipes + Boiler	4	Heat>Cool>Dry>Fan
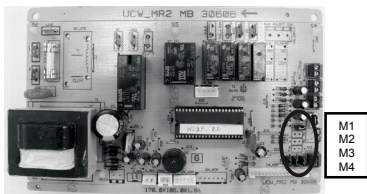
The standard W2.0 board comes with a VALVE jumper. The system can be configured as the jumper selection listed below:

	VALVE jumper	HEAT jumper
Heatpump Mode & Valve Application	√	√
Heatpump Mode & Valveless Application	X	√
Cooling Mode & Valve Application	√	X
Cooling Mode & Valveless Application	X	X

√ : Jumper Remained   X : Jumper Removed

VALVE & HEAT Jumper Location
1. VALVE jumper is plugged into JVLV connector on the emergency switchboard.
2. HEAT jumper is plugged into JMODE connector on the emergency switchboard.
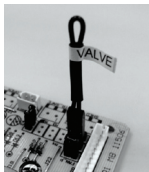
Service Diagnosis

Self Diagnosis Table

Wall Mounted F Series Cooling Only Model

Model	Board	Handset
WM 10/15/20/25F, 311	D2.0	G7

LED Indicator Light Display

◷ TIMER		▢ POWER	
★ SLEEP		◆ DRY	

LED Light Diagnosis Table

▢	★	◷	◆	Operation / Faulty Indication
○ / ●		○		Timer On
○	○			Sleep mode On
○			○	Dry mode
● Continuously			○ / ●	Defrost mode
● Once every 2 sec				Room air sensor contact loose / short
●● Twice every 2 sec				Indoor coil sensor contact loose / short
●●● 3 times every 2 sec				Gas leak

○ ON   ○ / ● ON or OFF   ● BLINKING

Wall Mounted F Series Heat Pump Model

Model	Board	Handset
WM 10/15/20/25FR, 301R	U1.5	G7

LED Indicator Light Display

Symbol	Meaning	Symbol	Meaning
❄	COOL (Green)	💧	DRY (Orange)
❄ / 🌀	HEAT / FAN (Red / Green)	★	SLEEP (Red)

LED Light Diagnosis Table

❄	💧	🌀	☀	★	Operation / Faulty Indication
◯				◯ / ●	Cooling mode
	◯				Dry mode
		◯			Fan mode
			◯	◯ / ●	Heating mode
◉			◯	◯ / ●	Auto mode in heating operation
◯			◉	◯ / ●	Auto mode in cooling operation
			◉		Defrost mode
◉					Compressor overload protection
				◉	Indoor coil sensor contact loose / short
	◉				Outdoor coil sensor contact loose / short
		◉			Room air sensor contact loose / short
◉	◉				Gas leak

◯ ON   ◯ / ● ON or OFF   ◉ BLINKING

Wall Mounted G Series Model

Model	Board	Handset
WM 10/15/20/25G/GR	L2.0	G11 / SLM3 / Netware 3

LED Indicator Light Display

★	SLEEP	⏻	COOL / HEAT
🕐	TIMER	⬆	IONIZER

LED Light Diagnosis Table

★	⏻ COOL/HEAT (GREEN/RED)	🕐	⬆	Operation / Faulty Indication
○ / ●	○ Green		○ / ●	Cooling mode
○ / ●	○ Red		○ / ●	Heating mode
○ / ●	○ Red		○ / ●	Auto mode in heating operation
○ / ●	○ Green		○ / ●	Auto mode in cooling operation
	○	○		Timer On
○	○			Sleep mode On
	○		○	Ionizer On
	○		○ / ●	Fan mode On
	○		○ / ●	Dry mode On
	● 1 time			Room air sensor contact loose / short
	● 3 times			Outdoor coil sensor contact open
●	● 2 times			Indoor coil sensor contact open
		● 1 time		Compressor overload protection / Indoor coil sensor short / Outdoor coil sensor short
	● Red			Defrost mode
		● 3 times		Gas leak
		● 6 times		Hardware error (tact switch pin short)

○ ON	○ / ● ON or OFF	● BLINKING

Ceiling Cassette A / B / C Series Model

Model	Board	Handset
CK 20/25/30/40/50A/AR	U1.5	G7 / SLM3 / Netware 3
CK 15/20/25B/BR	U1.5	G7 / SLM3 / Netware 3
CK 10/15/20C/CR	U1.5	G7 / SLM3 / Netware 3

LED Indicator Light Display - Cooling

⏻	🕒	★
POWER	TIMER	SLEEP

LED Indicator Light Display – Heating

⏻	🕒	☀
POWER	TIMER	HEAT

LED Light Diagnostic Table

⏻	🕒	★	☀	Operation / Faulty Indication
○				Cooling mode
○	○			Timer On
○		○		Sleep mode On
○			○	Heating mode
◉ Continuously			○ / ●	Frost prevention mode
◉ Once every 3 sec				Compressor overload protection
◉◉ Twice every 3 sec				Pump fault
◉◉◉ 3 times every 3 sec				Gas leak
◉◉◉◉ 4 times every 3 sec				Room / indoor / outdoor coil sensor contact loose / short

○ ON   ○ / ● ON or OFF   ◉ BLINKING

Ceiling Cassette A / B / C Series Model

Model	Board	Handset
CK 20/25/30/40/50A/AR	L208A	G7 / SLM3 / Netware 3
CK 15/20/25B/BR	L208A	G7 / SLM3 / Netware 3
CK 10/15/20C/CR	L208A	G7 / SLM3 / Netware 3

LED Indicator Light Display - Cooling

⏻ POWER	🕒 TIMER	★ SLEEP

LED Indicator Light Display – Heating

⏻ POWER	🕒 TIMER	☀ HEAT

LED Light Diagnostic Table

⏻	🕒	★	☀	Operation / Faulty Indication
◯				Cooling mode
◯	◯			Timer On
◯		◯		Sleep mode On
◯			◯	Heating mode
◯			◉	Auto mode in cooling operation
◯			◯	Auto mode in heating operation
	◉ 1 time			Compressor overload protection / Indoor coil sensor short / Outdoor coil sensor short
	◉ 2 times			Pump fault
	◉ 3 times			Gas leak
◉ 1 time				Room air sensor contact loose / short
◉ 2 times				Indoor coil sensor contact open
◉ 3 times				Outdoor coil sensor contact open

◯ ON   ◯ / ● ON or OFF   ◉ BLINKING

Ceiling Exposed D Series Model

Model	Board	Handset
CE 20/25/30/40/50D/DR	U1.5	G7 / SLM3 / Netware 3

LED Indicator Light Display - Cooling

❄	◐	✺
COOL	DRY	FAN

LED Indicator Light Display – Heating

❄	◐	✺	☀
COOL	DRY	FAN	HEAT

LED Light Diagnostic Table

❄	◐	✺	☀	Operation / Faulty Indication
○				Cooling mode
	○			Dry mode
		○		Fan mode
			○	Heating mode
○			◉	Auto mode in cooling operation
◉			○	Auto mode in heating operation
			◉	Defrost mode
◉				Compressor overload protection
◉	◉			Gas leak
	◉			Outdoor coil sensor contact open / short
	◉	◉		Indoor coil sensor contact open / short
		◉		Room air sensor contact loose / short

○ ON   ○/● ON or OFF   ◉ BLINKING

Ceiling Exposed D / E Series Model

Model	Board	Handset
CE 20/25/30/40/50D/DR	L208A	G7 / SLM3 / Netware 3
CE 15/20/25/28E/ER	L208A	G11 / SLM3 / Netware 3

LED Indicator Light Display - Cooling

❄	💧	🌀
COOL	DRY	FAN

LED Indicator Light Display – Heating

❄	💧	🌀	❋
COOL	DRY	FAN	HEAT

LED Light Diagnostic Table

❄	💧	🌀	❋	Operation / Faulty Indication
○				Cooling mode
	○			Dry mode
		○		Fan mode
			○	Heating mode
○			◉	Auto mode in cooling operation
◉			○	Auto mode in heating operation
◉				Compressor overload protection / Indoor coil sensor short / Outdoor coil sensor short
◉	◉			Gas leak
	◉			Outdoor coil sensor contact open
	◉	◉		Indoor coil sensor contact open
		◉		Room air sensor contact loose / short

○ ON   ○ / ● ON or OFF   ◉ BLINKING

Seven Segment Display – SLM3 / Netware 3

Model	Board	Handset
WM 10/15/20/25FR, 301R	U1.5	SLM3 / Netware 3
CK 20 - 50A/AR	U1.5	SLM3 / Netware 3
CK 15 - 25B/BR	U1.5	SLM3 / Netware 3
CK 10 - 20C/CR	U1.5	SLM3 / Netware 3
CE 20 - 50D/DR	U1.5	SLM3 / Netware 3
CC 10 - 60C/CR	U1.5	SLM3 / Netware 3

Cooling / Heat pump Model

Seven Segments	Faulty Indication
E1 blinking	Room air sensor contact loose / short
E2 blinking	Indoor coil sensor contact loose / short
E3 blinking	Outdoor coil sensor contact loose / short
E4 blinking	Compressor overload protection
E5 blinking	Gas leak
E6 blinking	Pump fault*
HEAT LED blinking	Defrost mode (SLM3 only)

*Applicable for Ceiling Cassette Model only.

Model	Board	Handset
WM 10/15/20/25G/GR	L2.0	SLM3 / Netware 3
CK 20 - 50A/AR	L208A	SLM3 / Netware 3
CK 15 - 25B/BR	L208A	SLM3 / Netware 3
CK 10 - 20C/CR	L208A	SLM3 / Netware 3
CE 20 - 50D/DR	L208A	SLM3 / Netware 3
CE 15 - 28E/ER	L208A	SLM3 / Netware 3
CC 10 - 60C/CR	L208A	SLM3 / Netware 3
CC 30 - 100D/DR	L208A	SLM3 / Netware 3

Cooling / Heat pump Model

Seven Segments	Faulty Indication
E1 blinking	Room air sensor contact loose / short
E2 blinking	Indoor coil sensor contact open
E3 blinking	Outdoor coil sensor contact open
E4 blinking	Compressor overload protection / Indoor coil sensor short / Outdoor coil sensor short
E5 blinking	Gas leak
E6 blinking	Pump fault*
E7 blinking	Outdoor coil sensor exist (Multi-split model)
E8 blinking	Hardware error (tact switch pin short)

*Applicable for Ceiling Cassette Model only.

Ducted Blower B/C/D/ER Series Model – Single Compressor
Rooftop Packaged Air Conditioner – Single Compressor

Model	Board	Handset
SB 75 – 100B/BR	L208A	SLM3
SB 75 – 100D	L208A	SLM3
SB 75 – 100ER	L208A	SLM3
SB 125 – 150B/BR	U1SB125	SLM3
SB 125CR	U1SB125	SLM3
SB 125 – 150D	U1SB125	SLM3
SB 125 – 150ER	U1SB125	SLM3
RT 55 – 120A/AR	U1SB125	SLM3

Seven Segment Display – SLM3

Seven Segments	Faulty Indication
E1 blinking	Room air sensor contact loose / short
E2 blinking	Indoor coil sensor contact open
E3 blinking	Outdoor coil sensor contact open
E4 blinking	Compressor overload protection / Indoor coil sensor short / Outdoor coil sensor short
E5 blinking	Gas leak

Ducted Blower B/D/ER Series Model – Multi Compressors
Rooftop Packaged Air Conditioner – Multi Compressors

Model	Board	Handset
SB 150B2/BR2 – 600B4/BR4	SQ2.0	SQ-LCD
SB 125D2 – 500D4	SQ2.0	SQ-LCD
SB 125ER2 – 600ER4	SQ2.0	SQ-LCD
RT 150 – 420A/AR	SQ2.0	SQ-LCD

Error Code

When the system is on and an error occurs, the ON/OFF LED on the LCD panel will blink and an error code is shown. When the system is off and there is a thermistor error, the ON/OFF LED is off but the error code is still displayed. Each error code represents different message as below:

Error Code	Faulty Indication	Error Code	Faulty Indication
E01	Require manual reset (possible causes)	E19	Indoor coil sensor 4 short
E02	Compressor 1 high temperature (overload)	E20	Indoor coil sensor 1 open
E03	Compressor 2 high temperature (overload)	E21	Indoor coil sensor 2 open
E04	Compressor 3 high temperature (overload)	E22	Indoor coil sensor 3 open
E05	Compressor 4 high temperature (overload)	E23	Indoor coil sensor 4 open
E06	Compressor 1 high pressure trip / contact open	E24	Outdoor coil sensor 1 short
E07	Compressor 2 high pressure trip / contact open	E25	Outdoor coil sensor 2 short
E08	Compressor 3 high pressure trip / contact open	E26	Outdoor coil sensor 3 short
E09	Compressor 4 high pressure trip / contact open	E27	Outdoor coil sensor 4 short
E10	Compressor 1 trip / low refrigerant / outdoor abnormal	E28	Outdoor coil sensor 1 open
E11	Compressor 2 trip / low refrigerant / outdoor abnormal	E29	Outdoor coil sensor 2 open
E12	Compressor 3 trip / low refrigerant / outdoor abnormal	E30	Outdoor coil sensor 3 open
E13	Compressor 4 trip / low refrigerant / outdoor abnormal	E31	Outdoor coil sensor 4 open
E14	Room sensor short	E32	Compressor 1 de-ice
E15	Room sensor open	E33	Compressor 2 de-ice
E16	Indoor coil sensor 1 short	E34	Compressor 3 de-ice
E17	Indoor coil sensor 2 short	E35	Compressor 4 de-ice
E18	Indoor coil sensor 3 short		

Wall Mounted F Series Inverter Model

Model	Board	Handset
WMX 10/15FR	VA2.0	G7

LED Indicator Light Display

❄ / 💧	COOL / DRY	☀ (standby)	Stand-by / Fan
☀	HEAT	⏲	TIMER

LED Light Diagnosis Table

❄ 💧	☀	Stand-by/Fan	TIMER	Operation / Faulty Indication
○			○ / ●	Cooling mode
○			○ / ●	Dry mode
		○		Stand-by / Fan mode
	○		○ / ●	Heating mode
○	○		○ / ●	Auto mode
	●			Defrost mode
●				Compressor overload protection
			●	Indoor temperature sensors contact loose / short
		●		Outdoor temperature sensor contact loose / short
●		●		Gas leak / compressor overheat
●			●	Communication error between indoor and outdoor
		●	●	Inverter error / PFC error
	●	●		Outdoor total current trip / DC peak
●	●			Indoor fan feedback error

○ ON   ○ / ● ON or OFF   ● BLINKING

Wall Mounted G Series Inverter Model

Model	Board	Handset
WMX 10/15/20/25G/GR	VA3.0	G11

LED Indicator Light Display

★ SLEEP	⏻ COOL / HEAT
🕘 TIMER	⬆ IONIZER

LED Light Diagnosis Table

★	⏻ COOL/HEAT (GREEN/RED)	🕘	⬆	Operation / Faulty Indication
○ ●	○ Green		○ /●	Cooling mode
○ ●	○ Red		○ /●	Heating mode
○ ●	○ Orange		○ /●	Auto mode
	○	○		Timer On
○	○			Sleep mode On
	○		○	Ionizer On
	○		○ /●	Fan mode On
	○		○ /●	Dry mode On
	◉ Red			Defrost mode
	◉ Green			Indoor temperature sensor loose / short
		◉		Coil temperature sensor loose / short
			◉	Outdoor temperature sensor loose / short
◉	◉ Green			Compressor overload protection
	◉ Green		◉	IPM / PFC error
		◉	◉	Outdoor total current trip / DC peak
◉			◉	Compressor overheat / gas leak
	◉ Green	◉		Indoor fan feedback error
◉		◉		Communication error between indoor and outdoor

○ ON   ○ /● ON or OFF   ◉ BLINKING

Ceiling Cassette A/C Series Inverter Model

Model	Board	Handset
CKX 20/25A/AR	VA3.0	G11
CKX 10/15/20C/CR	VA3.0	G11

LED Indicator Light Display - Cooling

| POWER | TIMER | SLEEP |

LED Indicator Light Display – Heating

| POWER | TIMER | HEAT |

LED Light Diagnostic Table

⏻	🕐	★	☀	Operation / Faulty Indication
○				Cooling mode
○	○			Timer On
○		○		Sleep mode On
○			○	Heating mode
			◉	Defrost mode
◉ 1 time				Indoor temperature sensor loose / short
◉ 2 times				Outdoor temperature sensor loose / short
◉ 3 times				Communication error
◉ 4 times	◉			Compressor overload protection
◉ 5 times				Pump fault
◉ 6 times				Compressor overheat / gas leak
	◉			Outdoor over current
◉	◉			IPM / PFC / Partial switching

○ ON   ○ / ◉ ON or OFF   ◉ BLINKING

Ceiling Convertible E Series Inverter Model

Model	Board	Handset
CEX 15/20/25E/ER	VA3.0	G11

LED Indicator Light Display - Cooling

❄	◐	✿
COOL	DRY	FAN

LED Indicator Light Display – Heating

❄	◐	✿	☀
COOL	DRY	FAN	HEAT

LED Light Diagnostic Table

❄	◐	✿	☀	Operation / Faulty Indication
○				Cooling mode
	○			Dry mode
		○		Fan mode
			○	Heating mode
			◉	Defrost mode
◉ 1 time				Indoor temperature sensor loose / short
◉ 2 times				Outdoor temperature sensor loose / short
◉ 3 times				Communication error
◉ 4 times				Compressor overload protection
◉ 5 times				Pump fault
◉ 6 times				Compressor overheat / gas leak
	◉			Outdoor over current
◉		◉		IPM / PFC / Partial switching

○ ON　　○ / ◉ ON or OFF　　◉ BLINKING

Seven Segment Display

Model	Board	Handset
WMX 10 – 25G/GR	VA3.0	SLM3
CKX 20 – 25A/AR	VA3.0	SLM3
CKX 10 – 20C/CR	VA3.0	SLM3
CEX 15 – 25E/ER	VA3.0	SLM3
CCX 10 – 25C/CR	VA3.0	SLM3

Cooling / Heat pump Model

Seven Segments	Faulty Indication
E1 blinking	Indoor temperature sensor loose / short
E2 blinking	Outdoor temperature sensor loose / short
E3 blinking	Communication error
E4 blinking	Compressor overload protection
E5 blinking	Pump fault
E6 blinking	Compressor overheat / gas leak
E7 blinking	IPM / PFC / Partial switching
E8 blinking	Outdoor over current
E9 blinking	Indoor fan feedback error

Inverter Outdoor Unit

Model
SLX 10/15/20/25C/CR
MSV 25/35A
MSX 20/25/30A/AR

Normal running / compressor running RED LED blinking

No. of Blinks	Blinking Indication
1	Normal running, with no limitation
2	Voltage limit
3	Cooling unit: outdoor coil temperature limit Heating unit: indoor coil temperature limit
4	Total current limit
5	Discharge temperature limit
6	Cooling unit: indoor coil temperature limit
7	Indoor fan control
8	Outdoor frequency adjustment

Compressor stopped RED LED blinking

No. of Blinks	Faulty Indication	No. of Blinks	Faulty Indication
1	Outdoor ambient sensor error	15	DC fan motor feedback error
2	Outdoor coil sensor error	16	AC peak current error
3	Outdoor discharge sensor error / compressor overheat	17	Outdoor suction sensor error
4	DC compressor feedback error	18	None
5	Communication error	19	DC compressor speed control error
6	Over current error	20	None
7	No load	21	Outdoor suction pipe A sensor error
8	Over / under voltage	22	Outdoor suction pipe B sensor error
9	DC compressor start failure	23	Outdoor suction pipe C sensor error
10	Cooling overload	24	Outdoor suction pipe D sensor error
11	Defrost	31	Communication error with indoor A
12	IPM protection	32	Communication error with indoor B
13	Read EEPROM error	33	Communication error with indoor C
14	Write EEPROM error	34	Communication error with indoor D

Chilled Water Fan Coil Unit

Model	Board	Handset
WM 05 – 25FW, 301W	W1V3	G7 / SLM3 / Netware 3
CK 20 – 50AW/AWH	W1V3	G7 / SLM3 / Netware 3
CK 15 – 25BW	W1V3	G7 / SLM3 / Netware 3
CK 10 – 20CW	W1V3	G7 / SLM3 / Netware 3
CE 20 – 50DW/CBW	W1V3	G7 / SLM3 / Netware 3
CC 10 – 60CW	W1V3	SLM3 / Netware 3
SB 75 – 150BW	N/A	No Controller

Self Diagnostic Table – W1V3

Fault Indication	POWER LED / COOL LED	Other LEDs	Seven Segments
Room sensor missing	Blinks 4 times	FAN blinks	E1 blinking
Indoor coil sensor missing	Blinks 4 times	SLEEP blinks	E2 blinking
Pump fault	Blinks 2 times	COOL & FAN blink	E6 blinking
Pipe water temperature poor	Blinks 3 times	COOL & DRY blink	E4 blinking
Pipe water temperature fault	Blink 1 time	COOL blinks	E5 blinking

Model	Board	Handset
WM 07 – 25GW	W2	G11 / SLM3 / Netware 3
WM 301W	W2	G7 / SLM3 / Netware 3
CK 20 – 50AW/AWH	W2	G7 / SLM3 / Netware 3
CK 15 – 25BW	W2	G7 / SLM3 / Netware 3
CK 10 – 20CW	W2	G7 / SLM3 / Netware 3
CE 07 – 15CBW	W2	G7 / SLM3 / Netware 3
CE 20 – 50DW	W2	G7 / SLM3 / Netware 3
CE 15 – 25EW	W2	G11 / SLM3 / Netware 3
CC 10 – 60CW	W2	SLM3 / Netware 3
SB 75 – 150BW	N/A	No Controller

Self Diagnostic Table – W2

Fault Indication	COOOL LED	Seven Segments
Room sensor error (short/open)	Blink 1 time	E1
Pipe water sensor error (short/open)	Blink 2 times	E2
Water pump error	Blink 6 times	E6
Pipe water temperature fault	Blink 5 times	E5
Window open activated*	Blink 3 times	-
Antifreeze mode activated*	Blink 7 times	-
Load shedding activated*	Blink 8 times	-

*Applicable for 4 pipes applications only.

Model	Board	Handset
5WMWS 10/15/20/25GR	LWS2.0	G11 / SLM3 / Netware 3

LED Indicator Light Display

★	SLEEP	(¹)	COOL / HEAT
◷	TIMER	⬆	IONIZER

LED Light Diagnosis Table

★	(¹) COOL/HEAT (GREEN/RED)	◷	⬆	Operation / Faulty Indication
○ / ●	○ Green		○ / ●	Cooling mode
○ / ●	○ Red		○ / ●	Heating mode
○ / ●	○ Red		○ / ●	Auto mode in heating operation
○ / ●	○ Green		○ / ●	Auto mode in cooling operation
	○	○		Timer On
○	○			Sleep mode On
	○		○	Ionizer On
		●		Room air sensor contact loose / short Outdoor coil sensor contact loose / short
●		●		Indoor coil sensor contact open
	●	●		Compressor overload protection Gas leak
	● Red			Defrost mode

○ ON   ○ / ● ON or OFF   ● BLINKING

Ceiling Cassette A / B / C Series Model – Water Source Split Unit

Model	Board	Handset
5CKWS 20/25/30/40/50AR	LWS2.0	G7 / SLM3 / Netware 3
5CKWS 10/15/20CR	LWS2.0	G7 / SLM3 / Netware 3

LED Indicator Light Display – Heating

⏻ POWER	◷ TIMER	☀ HEAT

LED Light Diagnostic Table

⏻	◷	☀	Operation / Faulty Indication
○			Cooling mode
○	○		Timer On
○		○	Heating mode
○		●	Auto mode in cooling operation
○		○	Auto mode in heating operation
	● 1 time		Compressor overload protection
	● 2 times		Pump fault
	● 3 times		Gas leak
● 1 time			Room air sensor contact loose / short
● 2 times			Indoor coil sensor contact loose / open
● 3 times			Outdoor coil sensor contact loose / open

○ ON   ○/● ON or OFF   ● BLINKING

Seven Segment Display – SLM3 / Netware 3 (Water Source Split Unit)

Model	Board	Handset
5WMWS 10/15/20/25GR	LWS2.0	SLM3 / Netware 3
5CKWS 20 - 50A/AR	LWS2.0	SLM3 / Netware 3
5CKWS 10 - 20C/CR	LWS2.0	SLM3 / Netware 3
5CCWS 10 - 60C/CR	LWS2.0	SLM3 / Netware 3

Cooling / Heat pump Model

Seven Segments	Faulty Indication
E1 blinking	Room air sensor contact loose / short
E2 blinking	Indoor coil sensor contact loose
E3 blinking	Outdoor coil sensor contact loose
E4 blinking	Compressor overload protection / Indoor coil sensor short / Outdoor coil sensor short
E5 blinking	Gas leak
E6 blinking	Pump fault*
HEAT LED blinking	Defrost mode (SLM3 only)

*Applicable for Ceiling Cassette Model only.

General Check

When any air conditioner malfunction is noted, immediately switch off the power supply to the unit and contact the local dealer if necessary.

Problem Symptom	Check Item	Suggested Action
The unit does not work	Check the power supply	Check to make sure that the rated voltage is supplied.
	Check the fuse	Check and replace the fuse.
	Check the remote controller timer setting	Make sure the delay timer is set correctly.
Fan does not work	Check the power supply	Check to make sure that the rated voltage is supplied.
	Check the fan motor capacitor	Check and replace the capacitor.
	Check the fan motor	Check and replace the fan motor.
	Check the switch	Check and change the switch.
Fan work, but compressor does not work	Check if the thermostat setting too high	Reset thermostat.
	Check the compressor capacitor	Check and replace the capacitor.
	Check the compressor	Check and replace the compressor.
	Check the compressor contactor	Check and replace the contactor.
Air conditioner work but cooling not satisfactory	Check if the thermostat setting too high	Reset thermostat.
	Check if the condenser coil dirty	Clean the condenser coil.
	Check the condenser installation condition	Make sure the condenser is installed according to factory's recommendation.
	Diagnosis by service port pressure and operating Current	Check for insufficient refrigerant.
The air flow is too low	Check the air filter	Check and make sure the air filter is clean.
	Check the fan / blower condition	Check and make sure that the fan / blower are in good condition.
The remote controller light is dim	Check the battery	Check and replace the battery.
		Make sure the batteries are correctly inserted.

General Troubleshooting Guide

By means of pressure readings.

Pressure						Probable Cause
Data / Circuit	Too Low	A Little Low	Normal	A Little High	Too High	
High Side Low Side					● ●	1. Overcharged with refrigerant. 2. Non-condensable gases in refrigerant circuit (eg. Oil) 3. Obstructed air-intake / discharge. 4. Short circuit of hot air at condensing unit.
High Side Low Side	●				 ●	1. Poor compression / no compression (compressor defective). 2. Check valve stick in open position. 3. Reversing valve leaking (for heatpump only).
High Side Low Side	 ●	●				1. Undercharged with refrigerant. 2. Refrigerant leakage. 3. Air filter clogged / dirty (indoor unit). 4. Indoor fan locked (cooling). 5. Defective defrost control, outdoor coil freeze up (heating). 6. Outdoor fan locked (heating).
High Side Low Side				 ●	● 	1. Outdoor fan blocked (cooling). 2. Outdoor coil dirty (cooling). 3. Indoor fan locked (heating). 4. Indoor filter clogged dirty (heating).
High Side Low Side				● 	 ●	1. Air intake temperature of indoor unit too high.

By means of diagnostic flow chart:

Generally, there are two kinds of problems, i.e. starting failure and insufficient cooling/heating. "Starting failure" is caused by electrical defect while improper application or defects in refrigerant circuit causes "Insufficient cooling / heating".

i) Diagnosis of Electric circuit

⬭ : Faulty ◇ :Check ▭ :Cause ----- :Remedy

No cooling/heating (Unit fails to start)

Evaporator fan motor — Stop

Unit power supply — Faulty
- No voltage or low voltage ----- Get the right voltage
- Wrong phase/missing phase ----- Repair the power line

Fuse for operation circuit — Blown
- Components shorted ------- Repair or replace the components
- Connections loose --- Tighten the connections

Running

Over current relay for evaporator fan — Tripped
- High or low voltage ----- Get the right voltage
- Wrong phase/missing phase ----- Check the power supply to the motor: repair when necessary

Evaporator fan contactor — Faulty
- Coil burned ----- Change the contactor
- Contact faulty ------ Repair the contacts
- Faulty fan motor -------- Repair or change the motor
- Defective operation -------- Repair or change the switch

Condenser fan motor — Stop

Over current relay for condenser fan — Tripped
- No voltage or low voltage ----- Get the right voltage
- Wrong phase/missing phase ------ Check the power supply to the motor: repair when necessary

Running

① ②

```
①        ②
          │
          ▼
    ┌─────────────┐  Faulty   ┌──────────────────┐
    │  Condenser  │──────────▶│   Coil burnt     │- - - - - - Change the contactor
    │ fan contactor│          ├──────────────────┤
    └─────────────┘           │  Contact faulty  │- - - - - - Change the contacts
                              ├──────────────────┤
                              │ Fan motor faulty │- - - - - Repair or change the motor
                              ├──────────────────┤                    contactor
                              │ Other electrical │- - - - Repair or change if necessary
                              │ component faulty │
                              └──────────────────┘

    ┌─────────────┐  Faulty   ┌──────────────────┐
    │ Compressor  │──────────▶│   Coil burnt     │- - - - - - Change the contactor
    │  contactor  │           ├──────────────────┤
    └─────────────┘           │  Contact faulty  │- - - - - - Change the contacts
                              ├──────────────────┤
                              │ Open compressor  │- - - - - - Change the compressor
                              │   windings       │
                              ├──────────────────┤
                              │ Incorrect wiring │- - - - - - Correct the wiring
                              └──────────────────┘
```

The most common causes of air conditioner failure to "start" are :
a) Voltage not within ± 10% of rated voltage.
b) Power supply interrupted.
c) Improper control settings.
d) Air conditioner is disconnected from main power source.
e) Fuse blown or circuit breaker off.

ii) Diagnosis of Refrigerant Circuit / Application

There might be some causes where the unit starts running but does not perform satisfactorily, i.e. insufficient cooling. Judgement could be made by measuring temperature difference of indoor unit's intake and discharge air as well as running current.

| ⬭ : Faulty | ⬠ : Check | ▭ : Cause | ---- Remedy |

Insufficient cooling

Air circulation — Restricted
- Indoor / outdoor coil dirty (clogged) ---- Clean the coil
- Indoor air filter dirty ---- Clean the filter
- Fan motor malfunction ---- Change or repair the motor
- Obstruction at air inlet / outlet of indoor / outdoor unit ---- Remove the obstruction

High cooling load
- Excessive heat source. e.g. electric kettle — Remove or reduce heat source
- Room overcrowded with people — Reduce number of people in the room
- Windows / doors wide open ---- Close the windows / doors

Refrigerant circuit
- Refrigerant short charge or refrigerant leakage ---- Add refrigerant. Repair leakage if detected
- Restriction e.g. at strainer, capillary, filter dryer, etc. ---- Repair clogging or replace faulty components

Compressor
- Less or no compression (Low running current) ---- Replace compressor

Satisfactory operation with temperature difference of air intake & discharge of indoor unit 8°C to 13°C. *
(* value is for reference only)

```
┌─────────────────────────┐
│  Insufficient heating   │
└─────────────────────────┘
            │
            ▼
     ┌──────────────┐  Restricted   ┌─────────────────────────┐
     │     Air      │──────────────▶│ Indoor / outdoor coil   │·········· Clean the coil
     │ circulation  │               │ dirty (clogged)         │
     └──────────────┘               ├─────────────────────────┤
            │                       │ Indoor air filter dirty │·········· Clean the filter
            │                       ├─────────────────────────┤
            │                       │ Fan motor malfunction   │·········· Change or repair
            │                       ├─────────────────────────┤           the motor
            │                       │ Obstruction at air      │
            │                       │ inlet / outlet of       │·········· Remove the obstruction
            │                       │ indoor / outdoor unit   │
            │                       └─────────────────────────┘
            ▼
     ┌──────────────┐               ┌─────────────────────────┐
     │ High heating │──────────────▶│ Windows / doors wide    │·········· Close the
     │     load     │               │ open                    │           windows / doors
     └──────────────┘               └─────────────────────────┘
            │
            ▼
     ┌──────────────┐               ┌─────────────────────────┐
     │  Refrigerant │──────────────▶│ Refrigerant short charge│           Add refrigerant. Repair
     │   circuit    │               │ or refrigerant leakage  │·········· leakage if detected
     └──────────────┘               ├─────────────────────────┤
            │                       │ Restriction e.g. at     │
            │                       │ strainer, capillary,    │·········· Repair clogging or
            │                       │ filter dryer, etc.      │           replace faulty components
            │                       └─────────────────────────┘
            ▼
     ┌──────────────┐               ┌─────────────────────────┐
     │  Compressor  │──────────────▶│ Less or no compression  │·········· Replace compressor
     └──────────────┘               │ (Low running current)   │
                                    └─────────────────────────┘
```

┌──┐
│ Satisfactory operation with temperature difference of air   │
│ intake & discharge of indoor unit 14°C to 20°C. *   │
│ (* value is for reference only)   │
└──┘

Mini Chiller: Troubleshooting Guide

When any malfunction is occurred, immediately switch off the power supply to the unit, and contact the local dealer, if necessary. Some simple troubleshooting tips are given below:

Symptoms	Possible Causes	Remedial Action
1. Compressor does not start	• No power supply • Fuses blown or automatic circuit breakdown open • Defective contactor or coil • Unit is stopped because a safety has tripped • Loose wires • Compressor faulty	• Check power supply • Look for short circuit or grounded wires in motor windings • Replace fuses and reset circuit breakers when the fault has been corrected • Check lightness and soundness of all electrical connection • Repair or replace • Determine the type of safety shut down and correct the unit is restarted • Check wire connection and tighten terminal screw • Contact local dealer
2. Fan does not start	• No power supply • Fan motor faulty	• Check power supply • Contact local dealer
3. Air conditioning does work, but insufficient cooling	• Thermostat setting too high • Condenser coil dirty • Obstacle blocking air inlet or outlet of the unit • Insufficient refrigerant in the system • Improper water flow rate • Water in the system is contaminated	• Reset thermostat • Contact local dealer • Remove the obstacle • Contact local dealer • Contact local dealer • Contact local dealer

Rooftop: Troubleshooting Guide

Before you ask for repair service, check the following points

Symptoms	Switch Box (Field Supply)	Possible Causes	Troubleshooting
It does not run	Switch (ON)	• Power failure	• Press the switch (ON) button after power restoration.
		• The power supply is turned OFF	• Turn the power supply ON
		• The fuse in the power supply is gone	• Replace the fuse
		• The earth leakage breaker is gone	• Put in the earth leakage breaker
		• The wiring phase of power supply is mistaken	• Modify the wiring phase of power supply
Air flow out but it does not cool enough	Switch (ON)	• Improper temperature adjustment	• After checking the set temperature and inlet temperature adjust thermostat (23WA)
		• The filter is filled with dust and dirt	• Clean the filter
		• There are some obstacles at the air inlet and outlet of the units	• Remove the obstacle
		• Windows and doors are open	• Close the windows and doors
Cool air does not come out	Switch (ON)	• The restart-preventing circuit is in operation for 3 minutes	• Wait for a while (to protect the compressor, a 3 minutes restart-preventing circuit is built into the unit. Therefore, there are occasions sometimes when the compressor does not start running immediately. There are cases when it does not run for as long as 3 minutes)
Fan runs but compressor does not run		• The set temperature of thermostat is too high	• For temperature control, decrease the set temperature at cooling
		• The room temperature is excessively low for cooling	• Can not be operated as it is out of temperature control range
Compressor run but stops immediately		• Air outlet and inlet are blocked	• Remove blocking matter
Water or steam is discharged from the unit		• At cooling, water which places to cooling piping and piping connection part drops	• It is not a breakdown. Please use it as it is

Appendix

Resistance – Temperature Characteristics

Type	DTN-C1 03F3H-OYL 1128, 1148, 1158
Material Name	3H
Resistance	R25=10.000kΩ + 1.0% - 1.0%
B Value	B25/30=3450K + 1.0% - 1.0%

t°C	Rmin (kΩ)	Rnom (kΩ)	Rmax (kΩ)	t°C	Rmin (kΩ)	Rnom (kΩ)	Rmax (kΩ)
-10	4.42E+01	4.53E+01	4.65E+01				
-8	4.02E+01	4.12E+01	4.22E+01	42	5.28E+00	5.37E+00	5.45E+00
-6	3.66E+01	3.74E+01	3.83E+01	44	4.92E+00	5.01E+00	5.09E+00
-4	3.33E+01	3.41E+01	3.49E+01	46	4.59E+00	4.67E+00	4.76E+00
-2	3.04E+01	3.11E+01	3.18E+01	48	4.29E+00	4.37E+00	4.42E+00
0	2.78E+01	2.84E+01	2.90E+01	50	4.01E+00	4.09E+00	4.16E+00
2	2.54E+01	2.59E+01	2.65E+01	52	3.75E+00	3.82E+00	3.90E+00
4	2.33E+01	2.37E+01	2.42E+01	54	3.51E+00	3.58E+00	3.65E+00
6	2.14E+01	2.18E+01	2.21E+01	56	3.29E+00	3.36E+00	3.43E+00
8	1.96E+01	2.00E+01	2.03E+01	58	3.08E+00	3.15E+00	3.22E+00
10	1.80E+01	1.83E+01	1.86E+01	60	2.89E+00	2.96E+00	3.01E+00
12	1.66E+01	1.69E+01	1.71E+01	62	2.71E+00	2.78E+00	2.84E+00
14	1.53E+01	1.55E+01	1.57E+01	64	2.55E+00	2.61E+00	2.67E+00
16	1.41E+01	1.43E+01	1.45E+01	66	2.40E+00	2.45E+00	2.51E+00
18	1.30E+01	1.32E+01	1.33E+01	68	2.25E+00	2.31E+00	2.37E+00
20	1.20E+01	1.22E+01	1.23E+01	70	2.12E+00	2.17E+00	2.23E+00
22	1.11E+01	1.12E+01	1.14E+01	72	2.00E+00	2.05E+00	2.10E+00
24	1.03E+01	1.04E+01	1.05E+01	74	1.88E+00	1.93E+00	1.98E+00
26	9.52E+00	9.62E+00	9.72E+00	76	1.77E+00	1.82E+00	1.87E+00
28	8.82E+00	8.92E+00	9.02E+00	78	1.67E+00	1.72E+00	1.77E+00
30	8.17E+00	8.27E+00	8.37E+00	80	1.58E+00	1.62E+00	1.67E+00
32	7.58E+00	7.68E+00	7.78E+00	82	1.49E+00	1.53E+00	1.58E+00
34	7.04E+00	7.14E+00	7.23E+00	84	1.41E+00	1.45E+00	1.49E+00
36	6.54E+00	6.64E+00	6.73E+00	86	1.33E+00	1.37E+00	1.41E+00
38	6.09E+00	6.18E+00	6.27E+00	88	1.26E+00	1.30E+00	1.34E+00
40	5.67E+00	5.75E+00	5.84E+00	90	1.19E+00	1.23E+00	1.27E+00